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How to submit articles
Articles which are submitted for publication should not be more than 1000 words long.

A submissions should be typed and a double space should be left between each line.

Programs should wherever possible be computer printed.

At present we cannot guarantee to return every submitted article so please keep a copy.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week



Editorial

Copyright is a vexed subject for software writers and companies alike.

No one likes having their programs copied and marketed without their permission. Quite apart from any question of royalties there is a matter of pride. The program which you have spent hours slaving over is your baby and no one else's.

Unfortunately the legal position on software copyright is far from clear. There has yet to be a test case in the courts to establish just what software can and cannot be protected by copyright.

Some software writers have tried to get around this problem by taking out patents on their programs. But there are some doubts as to the effectiveness of this method of software protection.

There have been few reported cases of software misappropriation but this is no reason for complacency.

There is an obvious need for some form of legal safeguard for software writers. However for all the publicity surrounding Information Technology 82, there are no signs that the government is doing anything to resolve the problem.

Next Week



It's a matter of life or death and the very cells are under your command in this exciting new game

Classified

VIC-20 WITH 24K STACK [illegible] ROM [illegible] and 3K [illegible] unit, machine code monitor, joy stick [illegible] Tel [illegible]

COMPUKIT UK101 8K, [illegible] manual £150 Tel [illegible]

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If you wish to [illegible] your ad, [illegible] ring Alastair Macintosh 01 [illegible]

[illegible] [illegible] for [illegible] 2MO

ZX81 16K mortgage program, gross and net monthly repayments. [illegible] Estimate effect of inflation on all types. £4 [illegible] 47 [illegible] Sutton-Houghton-le-Spring Tyne and Wear DH4 6EA

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ZX81 16K [illegible] printer PSU, [illegible] cassette [illegible] separately or together £110 [illegible]

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ZX81 (1K) FROM PROGRAM. [illegible] cassette and use as [illegible] Crescent, Eyemouth, [illegible]

ZX81 16K LIBRARY INDEX. [illegible] decent with [illegible] — machine code sort by Author/Title, Prints our 1 categories. Fiction, Non-fiction etc. Can be [illegible] for other listings. Cassette £5 [illegible] Sherford [illegible]

[illegible] MICRO GAMES. Cassette A [illegible] A and B [illegible] (machine code) [illegible] — £5 (inc.) [illegible] (machine code) 3D [illegible] — £6 (inc.) Both cassettes for £8 (inc.) From [illegible], 8 [illegible] Avenue Fleetwood, Lancs FY7 6PA

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CASSETTES FOR MICRO USERS. High quality [illegible] C15 with labels. Try ten for only £5 inclusive. Discount for quantity [illegible] Leatherhead Surrey

VIC-20 PLUS 16K [illegible] and C2N cassette unit with [illegible] from [illegible] ROM. "[illegible]" (16K) [illegible] further [illegible] All new £270 [illegible]

ZX81 16K memory plus [illegible] Telephone Kings Langley [illegible] [illegible] 8 pm

HEARING IS BELIEVING

[illegible] [illegible] ZX81 [illegible]

COMPUSOUND
32 Langley Close
Redditch Worcs B98 0ET

ZX81 16K, full travel keyboard, £25 of cassettes including Defender and Asteroids. £95. Telephone [illegible] after 8 pm

ZX81 16K, tapes, [illegible] (0706) [illegible] 3747 [illegible]

HANGMAN for ZX81 (16K) cassette large vocabulary £2.95 C [illegible] 11 Juniper [illegible] Stratford

ZX81 16K "[illegible]" — [illegible] moving across the horizon "[illegible]" (machine code) [illegible] £4.95 [illegible] 21 [illegible] Edinburgh EH8 [illegible]

ZX81 [illegible] 16K RAM, manual, [illegible] cassettes altogether [illegible] Telephone [illegible]

Here's my classified ad.

(Please write your copy in capital letters on the lines below)

			[illegible]

I make this ______ words at ______ per word so I owe you £ ______

Name ______

Address ______

Telephone ______

Please cut out and send this form to: Classified Department, Popular Computing Weekly, [illegible] London W[illegible]

Helix ready to flex their micro-muscles

TWO new computer aids have been produced by Helix International.

The Computer Flowchart Template allows the easy and neat production of 19 flowchart symbols. These have been chosen to conform with the requirements of both the CSE/GCE examinations and the ISO and British Standards. The template is flexible and transparent and costs 75p.

The 40cm stepped edge Computer Rule costing 55p is designed to help read computer print-outs. It incorporates a line reader and has spacing and character digit space graduations.

Both are available from normal retail outlets or direct from Helix International, PO Box 15, Lye, Stourbridge, West Midlands.

Sinclair profits are soaring

PRE-TAX profits for Sinclair Research are expected to rise this year to over £10m. This is an increase of £9m over last year. Turnover is also up showing a [illegible]-fold increase over 1981.

New £50 micro challenges ZX81

WEST London company Binatone is developing a new microcomputer that will cost less than £50.

The Binatone micro will have 16k Ram, colour, sound and a typewriter style keyboard. It will use a standard version of Microsoft Basic similar to the Dragon 32.

The Binatone micro is due to go on sale in high street stores by the end of December. With anticipated sales of 400 000, Binatone is planning to compete directly with Sinclair's ZX81 and ZX Spectrum.

UMIST's Microfest

THE Microfest 82 show will be at UMIST on July 24 and 25. Admission £1 and 50p. PCW will be there.

Ready to roll: the [illegible] the Dragon 32

Will the Dragon be a hit or a myth?

METTOY is set to launch its new home computer — Dragon 32 micro.

This new home computer, with standard 32k Ram, full size keyboard, colour graphics and sound, will sell for less than £200. (See the review on page 121.)

Built by Dragon Data — a Mettoy subsidiary — the machine will be sold through the company's established high street retail outlets.

Mettoy, who manufacture Corgi toys, have for some years been concerned about the erosion of traditional toy markets.

Tony Clark, managing director of Dragon Data, who describes himself as a micro enthusiast, [illegible] standing explained that the Dragon had been "designed very much with the user in mind — we have tried to make the thing as easy to use as possible."

Although early work was conducted by Swansea University, the major design work was carried out by the PA Technology Centre in Cambridge. The company, a multi-discipline contract research house, started on the design in September 1981.

Mettoy has an established manufacturing base equipped for high volume production and by the end of the year more than 30 000 units will have been produced.

The Dragon 32 costs £199.95 and will be available in the shops from August 2.

Disc drive hits Beeb add-on list

THE [illegible] disc drives for the BBC Model B [illegible] should be on their [illegible] customers by the middle of July.

The 5¼ inch 80 track double-sided double-density discs have a formatted capacity of 100K.

The units are being manufactured by R H Electronics.

For the disc drives to be used with the BBC machine the micro must be modified to incorporate the disc interface. In the production models this will take the form of a Rom. The disc interface has to be fitted by an Acorn dealer.

Cost of the disc drives has not been finalised but should be around £300. The disc interface and installation cost will be about £70.

According to Acorn's Sohp [illegible] Cell, 17 000 orders for the drives have already been received.

In demand: the Beeb drive

The disc drive is the first of a series of additions for the BBC machine.

Joysticks and paddles should follow at the end of July and middle of August.

The first working Z80 card has now been completed and the first production run cards may also be seen in August.

A speech synthesiser should be out before the autumn and the 16-bit card is also planned for around the same time.

IBM computer secrets sold to Japanese

CONFIDENTIAL details of IBM's latest computer have been stolen and sold to leading Japanese electronic companies.

Eighteen employees of Hitachi and Mitsubishi, six in the US and the rest in Japan, have been issued with arrest warrants by the US Attorney's office in San Francisco.

The accused employees of the two leading Japanese companies are alleged to have paid more than $648 000 to an undercover FBI agent in return for what IBM describes as "important technical information" relating to the new 3081 computer and 3380 disc drive.

The information, provided voluntarily by IBM, was used by FBI agents to trap the accused. The charges filed for the arrest of senior executives and engineers include the general manager of Hitachi's Kanagawa plant, Mr Kisaburo Hakazawa.

Both Hitachi and Mitsubishi have admitted that they have been involved in the purchases of technological information from a California consultancy company.

The Tangerine disc is a hit

TANGERINE Computer Systems has launched a new complete disc operating system for the Microtan 65 computer.

Called the Tandos 65, it comprises a low-cost disc controller card, Tandos 65 operating system, disc drive connecting cable and either single or dual 40-track drives.

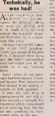
Tangerine's Paul Kaufman told PCW that he is delighted with the response to the new units.

The costs (exclusive of VAT) of the various parts of the system are as follows: disc controller card — £99; operating system — £35; disc drive connection — £15; single 40-track drive — £219; and dual 40-track drive — £399. Normal 28-day delivery applies to the Tandos 65 system.

Orders and enquiries to: Tangerine Computer Systems Ltd, The Science Park, Milton Road, Cambridge CB4 4BH.


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Atom Software

Letters



Technically, he was had!

As I got [illegible] to [illegible] [illegible] express [illegible] making my usual [illegible] through [illegible] W H Smith I [illegible] towards the computer magazine Rom shelving by a [illegible] black [illegible]

On page 1 at byte 0002 were the words BBC graphics Chips [illegible] a sample of this new Rom I dropped three bytes into the lady's outstretched hand and exited port W H Smith on to bus Victoria Street.

Later when all my interrupts had been cleared I scanned the new Rom directory to find several bytes missing — namely no BBC graphics.

I trust this new Rom is reprogrammable and will go from strength to strength. But I hasten to add that you should avoid seducing busy bits like me into sacrificing my hard earned bytes in this way.

Dennis Long
Sharnal St House
Rochester
Kent ME1 [illegible]

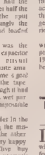


Save and load—whose fault?

Yet another letter on the subject of difficulties with load and save on the ZX81! I really cannot agree that the difficulties are anything like those which were undoubtedly experienced with the ZX80.

We have a User Group here in Hassocks with at least 20 machines to use and our experience is that with correctly built ZX81s saving and loading programs to and from your own cassette recorder is 95 per cent successful. Loading programs saved on someone else's recorder is less successful due to a variety of causes including dirty heads, misaligned heads, recording levels and tape faults.

However, two of our machines, both Sinclair built, were supplied with faults. Having built our own machine and hence possessing

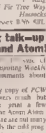


the circuit diagram I was able to diagnose one fault as a solder bridge between two adjacent pads. This had the effect of diverting over half the output signal into the input (Ear) circuit. Surprisingly the owner had saved and loaded the odd program.

The other fault was the omission of a 47pf capacitor from the output circuit altogether. Again quite amazingly there was some signal being recorded on the tape but it sounded as though it had been played through wet porridge and was quite impossible to load.

Removing the solder in the one case and fitting the missing component in the other made two owners very happy. Come on Uncle Clive buy your slaves some automatic test equipment — I dare say someone could adapt a ZX81 to do it.

P King
25 Fir Tree Way
Hassocks
Sussex BN6 8BL



Fighting talk—up guards and Atom!

In [illegible] June [illegible] issue of *Popular Computing Weekly* you made comments about Open Forum.

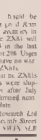
I have every copy of *PCW* and I like it very much but please, please print a few programs for the Acorn Atom. I know that there are not many of us, but surely the odd program would not go amiss.

R J Adams
82 Baldwin Road
Greenhill
Kidderminster

We've failed our own test

In your M[illegible] 13 Peek & Poke column Ian Be[illegible] wrote answered a query [illegible] faulty Roms in the Sin[illegible] ZX81 and described two tests to identify the problem. Unfortunately his second test was inaccurate and has led to some confusion among our customers.

For 10 PRINT [illegible] the



says the answer should be 42[illegible]296. As a good Rom is not capable of accuracy in the 10th digit the ZX81 will actually read 300 in the last three digits and not 296. Users getting 300 need have no worries about their ZX81s.

I should add that no ZX81s with faulty Roms were shipped to customers after July 1981 and only a limited number before that date.

Sinclair Research Ltd
23 Motcomb Street
London SW1X 8LB

Fingersnapping ZX keyboard

I felt I had [illegible] to say how impressed I was with the new [illegible] keyboard for the ZX81 which I [illegible] at the Microfair in [illegible] on Saturday May 1.

As soon as I returned home I easily assembled the keyboard and it worked first time. I will never use my old keyboard again. For £24.90 I find this keyboard from Kempston Electronics the best keyboard yet produced because it fits on the ZX81 itself.

I congratulated Mr Pandal on his product and hope other people were as impressed as I was.

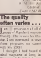
J D Mossley
25 Warren Bank
Simpson
Milton Keynes
Buckinghamshire



Sickened by Commodore

Having [illegible] the [illegible] page [illegible] Popular Computing Weekly May [illegible] the two shocks [illegible] the Sinclair Spectrum and the possible 50 percent reduction on the price of the Vic20. I did not know whether to get drunk, open my veins or jump from a tall building. I am a Vic20 owner.

Can we expect a firm statement from Commodore regarding what place the Vic20 will fill in their future range? I know the possible price reduction is too late for us Vic



owners [illegible] some [illegible]

It seems [illegible] almost half [illegible] paid for my V[illegible] superior [illegible]

[illegible] Hurd
9 [illegible] Road
Chelmsford
Essex CM2 6ES

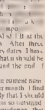
The quality often varies . . .

I am [illegible] possessor of all the issues of *Popular Computing Weekly*. The reason for this is that I am interested in saving these programs on cassette with my ZX81.

I thought I had found the ideal magazine at long last. However I find that I cannot read the programs due to the poor quality of the listings. Also some of the graphics are impossible to make out.

I hope there is a solution to this problem or I shall be forced to start looking for another magazine again.

R Fellin
67 Paddock Road
Lond[illegible]



Another case of them BBC blues

It [illegible] the [illegible] June [illegible] Acorn had [illegible] of BBC [illegible]

I ordered a Model B at the end of January. After three previous delivery dates I have now been told that it should be despatched around the end of June.

Looking at the current number of orders per month I find it highly unlikely that I should be in the 5,000 or so outstanding orders considering that my microcomputer was ordered so early. Is someone trying to pull the wool over somebody's eyes?

Incidentally, when I last telephoned BBC Marketing at the beginning of June I was told that the latest reason for delay was that Cleartone had gone into liquidation.

A Numan
18 Cavendish Avenue
London W1



COVER STORY

Time Traveller

Fly your ship through time barriers in this new game by BORIS ALLAN

You are the navigator of the space time vessel Sidrat, known affectionately as the *Star Thinker* by her crew.

The Sidrat was damaged when passing through a black hole and is now trapped in a space-time discontinuum. Your instruments are faulty but you have managed to jury rig one forward view screen for limited visibility. The on-board computer charts your progress through the discontinuum.

You are trying to limp home to Yerfillag, your home base which is outside time and space. But, there are a few obstacles to your progress.

Firstly there are the time barriers — high pressure incongruities which abound in the discontinuum. Normally Sidrat would pass through the time barriers without noticing them, but in her present damaged state they are almost impenetrable. Occasionally Sidrat will still be able to pass through a time barrier, but there is no way of knowing in advance whether or not you will be successful.

In addition, the S and a sensors are out of action. The time barriers will not appear on the screen until you run into them.

Another hazard is the pirate ship Relsam, a rogue frigate and inhabits the discontinuum looking for easy prey. Relsam will try to stop you from reaching your home by catching you in her vortex. Once inside the vortex, there is no escape.

Finally, a time warp sweeps through the discontinuum at random intervals. Every thing in its path is picked up, whirled around and deposited elsewhere in the discontinuum. There is nothing you can do to avoid the time warp; just start again from your new position.

Sidrat is represented on the screen by the letter S, Relsam by the letter R and Yerfillag by the letter Y. The time barriers will appear as black squares.

The program, which runs on a 16K ZX81, is written as a series of modules, so it should be fairly easy to convert it to other microcomputers. The initialisation module is contained in lines 200 to 360. To vary the level of difficulty simply adjust the values of the time elements (TB), time warp (TW) and topological constant (TC).

Lines 999 to 1050 create the discontinuous topology, details of which are stored in the two dimensional matrix A$. The module contained in lines 3000 to 3890 controls the movement of the pirate ship Relsam. Subject to the constraints of the time barriers, Relsam always tries to minimise the distance between herself and Sidrat.

The time warp is activated by the routine in lines 4000 to 4160.

To manoeuvre Sidrat press I for up, M for down, J for left and K for right.



Club Reports

Up among the highlands and bio-rhythms

***David Kelly** talks to Gordon Hewit of the hyperactive Edinburgh ZX Computer Club*

Gordon Hewit often feels guilty about being able to drive a car without understanding the laws of thermodynamics. Similarly he is unhappy about working with computers without understanding them.

To relieve these unsettling pangs he bought a ZX81.

Having seen a poster for the newly-formed Edinburgh ZX Computer Club he went along to their third meeting and the unthinkable happened. "Everyone else took a pace back and I found myself on the committee."

The club was formed in June 1981 by John Palmer and Keith Mitchell as an off-shoot from the Scottish Amateur Computer Society.

When Gordon first joined the group it was still in its infancy. All the work was being done by John and Keith and with more than 30 members they were finding it difficult to cope.

For this reason the decision to formalise the group was taken in February 1982. The committee was set up and a membership fee was charged.

The club now has about 50 paid-up members and many more casual non-members who occasionally "breeze in" on club nights. At a typical meeting there may be 10 machines and about 40 members. The meetings are held every month and the club is beginning to outgrow the room which it uses.

Visits have been organised to the Blackford Hill observatory computer suite and the ZX laboratory at Lasswade school.

Twice now the club has taken over a counter at the Edinburgh branch of WH Smith in order to demonstrate what a ZX81 can achieve. "People love to learn about their bio-rhythms," says Gordon, "but I don't know if it sells more computers."

He is delighted with the relationship the club has with the shop. As well as letting the group demonstrate the ZX81, WH Smith give out the club's leaflet and newsletter. In this way many new ZX81 owners in Edinburgh are made aware of the club.

Mark Cunningham is the committee member responsible for the newsletter. The bi-monthly publication keeps the members in touch with one another. It has



news, product reviews, discounts and buy-and-sell sections. There are articles written by the members but, as Gordon points out, "Getting the membership into writing is difficult."

The club holds regular day-long Saturday workshop sessions. These have proved so popular that the club is starting to run a series of programming courses.

The ZX Club runs their classes on basic and machine code at both ordinary and advanced levels and a course on basic electronics. Gordon runs the basic machine code class and Fraser McLaren does the advanced machine code tutorials.

Gordon is very committed to the club and he and his fellow committee members have worked hard to make the ZX group a success.

To celebrate their first six months as a formal group they are holding the first Scottish ZX fair.

The idea first came about when a ZX owner in Greenock wrote to a computer magazine suggesting a northern ZX fair. The reply given to the letter was that the enquirer need not worry because there

was to be a fair in Manchester. Gordon says: "We thought — if that is the way they think we will never see a Scottish show."

So the Edinburgh ZX Club decided to arrange their own fair. The main problem was finding a suitable venue.

"We looked at several church halls," says Gordon, "but they all had only two plug sockets — one at the front for the band and one at the back for the bar. I thought 'We're going to overload this little lot'."

"We eventually chose Meadowbank Stadium because of the facilities they offer — you can wreck a show by not having anyone selling Coca Cola."

The one-day fair, which will be held on July 24, will be the first of its kind in Scotland and it has generated a great deal of interest. The booking of stands for the show has been going well and there are now only one or two places for last-minute exhibitors.

Popular Computing Weekly will be at this first Scottish show on July 24. Entry will be 50p and 25p and the fair will be open from 10 am to 6 pm.

Edinburgh ZX Computer Club meets on the second Wednesday of every month between 7.30 and 10.30 pm in the Claremont Hotel, East Claremont Crescent, Edinburgh. Membership is £5 per year. (Membership for OAPs, under 16s and the unemployed is only £2.50.)

For further details of either the ZX fair or club contact: Gordon Hewit, 3 Buckstone Mains View, Edinburgh (Tel: 031 442 1183).

What's happening

New Mills Information Technology Group is in the process of being formed. Following their exhibition of new technology at New Mills Town Hall on June 25 the group hopes to hear from those interested in joining a general micro user group. Contact Martin Flanagan, 11 Sundown Close, New Mills (Tel: New Mills 44061).

Norwich and District BBC Micro-Computer User Group meets fortnightly with workshops and talks in Norwich City College. Contact Paul Beverley, Room B12a, Norwich City College (Tel: 0603 60011 ext 233).

Mid-Cheshire Computer Club meets on the second Friday of each month in the main Winsford Library (in the Town Centre Precinct) at 7.30 pm. Contact Dave Clare, Providence House, 222 Townfields Road, Winsford, Cheshire CW7 4AX (Tel: Winsford 51374).

Enter the Dragon

PCW staff present the first review of the Dragon

Home computing is a new phenomenon. Its short history has been dominated by a few names every bit as famous among microcomputer fans as Keegan and Dalglish are to football supporters.

A new name is about to enter the game. The Dragon 32 is firmly placed in the part of the market now dominated by Sinclair, Commodore and the BBC. More details of the Dragon company in the news report on page 5.

The Dragon 32 is a single box home computer which can be plugged into an ordinary domestic TV set. Its main features are a 32 column display compared to 23 on the Commodore Vic-20, full colour sound and high-resolution graphics.

It comes with 32K of Ram and costs £199.50. This compares with the 48K Ram Spectrum at £175 and the 5K Commodore Vic-20 at £199.

The machine is very light and comes in an oversized cream plastic case. At its highest point the case stands nearly five inches off the table.

A full sized typewriter style qwerty keyboard is built in. On the left hand side of the case is a centronics type parallel printer port, a cassette socket, a left and a right hand joystick socket, a reset button and a TV socket.

On the right hand side of the computer is a large program cartridge slot. At the rear there is a monitor socket for higher quality colour graphics, an on/off switch and the power socket.

The keyboard does not include any of the function keys which will now be familiar to all Vic-20 and BBC microcomputer owners. The *Clear* key is next to the *Enter* (*Return*) key. This is a mistake — it is far too easy to hit the *Clear* key by accident.

There is also no *Repeat* key or function. This, taken with the lack of function keys and the position of the *Clear* key, hinders the Dragon in many of its possible serious applications.

The resident Basic programming language inside the Dragon is one of the most up-to-date 16K versions from the ubiquitous American software house Microsoft. Most of the commands will seem familiar to users of larger machines though they are different from the versions used on the ZX81, Spectrum or Commodore Vic.

We will not explore each of the Basic commands in detail — only those which may be unfamiliar. The *Edit* facility is very similar to the one available on the BBC microcomputer. Once a line is called down for editing you move the cursor along a duplicate version of the line until you reach the point where you wish to change it.

The cassette operating system is one of the best features of the Dragon. A connector goes from the 5-pin DIN socket on the side of the Dragon to the mic, ear and remote inputs of any portable tape recorder.

The command *Cload* "program name" is used to load programs. When it is being used an S appears in the corner of the screen to indicate that it is searching. When the program is found the program name appears. If there is an error in loading, the machine prints I/O error.

The command *Csave* is used to save programs on tape. There is also a useful command *Skipf* program name which loads the program and the one specified. There is no *Verify* command, a feature which has recently become highly fashionable and, considering the difficulties there have been in loading tapes from some computers, necessary.

The *Audio* command will connect or disconnect the cassette output to the speaker on the television set. This is useful for educational software and can be used to great effect in programs such as Adventure.

Cloadm will load a machine code program. *Motor* is used to turn the cassette motor drive on and off when the *Audio* command is being used.

Open is used to open the cassette recorder channel for either input or output. *Close* will shut it.

Eof (-1) is an interesting command. It returns a logical *True* value if the end of the file marker is read off the cassette. *Input* will get data from a cassette file and *Print* can be used to write data to the cassette.

These highly advanced cassette handling commands, together with the computer's ability to interface with a single floppy disc unit, show that the Dragon 32 is considerably more than just a sophisticated toy.

The joystick is supported by a command in Basic called *Joystk (X)*. This will return the current position of the left or right hand joystick, depending on the value of X. The value returned by the function is in the range 0-63. Pressing a button on the joystick is detected by *Peeking* a memory address.

The print commands are next. Both *Print tab* and *Print @* are allowed, which is strange as both commands do the same thing. There are differences in the way the two commands are used, but why are they both necessary? Perhaps we have missed something. *Print using* is also available.

Exec is very similar to *Usr* on other



The internal design of the Dragon (left) is neat and robust. But the keyboard (right) is not good quality and the Clear key is too close to the Enter (Return) key

EXCLUSIVE!

Dragon



computers. *Clear* is another strange command but is actually a very good idea. It reserves an amount of Ram at a certain place for string storage.

The sound output from the Dragon lets the whole machine down. There is only one channel and the output is through the TV speaker.

There are two commands for handling this speaker. The first is *Sound a b*. This is really no better than the *Beep* command on the ZX Spectrum. The parameter a specifies the tone to be played, which must be in the range 1 to 255. The parameter b specifies the duration.

The note length can be specified as well as the tempo and there is some control over the volume, which clever programmers will be able to use to envelope their creations.

This all looks very good on paper, but wait until you hear the Dragon play. The Vic 20 has far better sound control with its choice of four voices.

Besides the clever cassette operating system, the other strong point of the Dragon lies in its graphics. The commands which can be used in the high-resolution graphics mode are varied and powerful. More importantly they are extremely fast, especially when compared to the incredibly tortuous and glacial speed of the ZX Spectrum.

The high resolution mode is set with the *Pmode* command. Within that you can use *Screen* to switch the display between the graphics and the text modes, *Draw* for drawing, *Line* for drawing straight lines, *Paint*, to fill a space with colour such as a circle drawn with the *Circle* command.

The smart clean lines of the new Dragon 32 processor

A number of pages of graphics can be stored in memory. Normally four different screens can be held in memory at any one time. They can be recalled almost immediately — fast enough to enable animation. The number of pages stored in this way can be increased simply by allocating an area of memory.

Another feature which particularly impressed us was the *Get* and *Put* commands. *Get* reads an area of the screen into an array where it can be manipulated. *Put* will place the contents of such a graphics array on to a specified area of the screen.

The reason why the high resolution graphics are so much faster than those on the Spectrum is probably because the Dragon 32 is built around the Motorola 6809 processor. This was a late entry into the field of 8-bit processors but supposedly combines the strongest features of the 6502 chip, which both Commodore and the BBC use, and the Z80 and Z80A chips used by Sinclair.

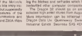
The internal design of the machine is spong and efficient. The heat sink is large enough and far enough away from the main board to ensure that there should be no problems of over-heating.

Summary

The manual is exceedingly poorly written and will prove well-nigh impenetrable to most first-time users. Sinclair and Commodore made the same mistake with their early manuals, but improved on them later — let us hope that Dragon can do the same.

The key question now is whether Dragon will come up with the software cassettes and cartridges it has promised, and whether it will be able to supply and manufacture the computer without suffering the hitches and setbacks which have bedevilled other computer companies.

The Dragon 32 should go on sale in selected high street stores from August 2. More information can be obtained from Dragon Data Ltd, Queensway, Swansea Industrial Estate, Swansea SA5 4EH.







The program cartridge slot (left) is on the right of the computer. Leads (right, top) the TV output, reset button, joystick ports, tape output and a Centronics printer port, are on the left. Power supply input, on-off and monitor output connections (right, bottom) are at the back.

POPULAR Computing WEEKLY

Discount Club

SPECIAL OFFER

PCW has negotiated a special discount offer on four of the top games cartridges for the Commodore Vic20. The cartridges are manufactured by Audiogenic.

SAVE £7 on Renaissance

PCW price £17.99 (List price £24.99)

Renaissance is the ultimate Othello package for the Vic20. Use joystick or keyboard control to play against the Vic. There are eight levels of play. During the game you can change sides and playing level, take back moves, set up and play special games. You can even save and recall whole games to and from cassette.

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In **Meteor Run** you must pilot your spaceship through the Meteor belt, blasting your way through the rocks and Alien saucers. Similar to an Asteroids game it includes an early warning radar display.

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To have these top cartridges sent to your home all you have to do is fill in the form below and send it off to *Popular Computing Weekly*.

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Quantity	Cartridge	Price
	Renaissance	£17.99
	Meteor Run	£[illegible]
	Spiders of Mars	£17.99
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Reviews
hardware

QS Chr$ board

Quicksilva [illegible] Road Maybush Southampton Hants
Price £[illegible]

This board allows you to reprogram the 128 characters making up the Sinclair character set at will.

The printed circuit board has to plug into a motherboard or Quicksilva connector (two edge connector sockets back-to-back) so it does not have an edge connector.

Once fitted it can change the appearance of any character on the screen, determined by a switch on the board. A tape provided with the characters board provides the software to run it in the form of a set of Rem statements at the beginning of the program but this need not waste any of your program Ram as, once the character generator has been programmed, the whole program can be Newd leaving the character set intact. Restoring the switch means that you have the original character set back if, for example, you want to change the program.

The characters board tape includes a program which produces a lower-case set of letters with proper descenders in place of the inverse letters. Therefore the ZX80 (with 8K Rom) or ZX81 may be used as a typewriter. The ZX80, however, requires a hardware modification to the ZX80 printed-circuit board so that a Rom CS line may be added to pin 23B.

The instructions and tape are superb and Quicksilva have rein conjunction forces with Artic to produce a chess program with proper pieces using the characters board.

On the board is 1K of Ram starting at address 33792 and, when the characters board is not required, this may be used to store machine code.

The uses of the characters board are not limited to those indicated by Quicksilva and the instructions included show how to program your own characters which could be scientific symbols or even hi-resolution characters. SA

Mastering computing

Macmillan boards
Price £4.95 (hardback)

Here two new titles in Macmillan's mammoth Master series are considered.

The books are *Computers* by G Wright (paperback £2.75 212pp) and *Computer programming* by P Gosling (paperback £2.95).

Both are of interest if you've not got many computing books and would like to increase your background library. But — be warned — computing books can never be satisfactory. The same is true of French books or physics books: the needs of each reader are different. In the case of computing we also have the twin problems that the subject is both new and fast changing.

Wright's book has a distinct slant towards the business user rather than the hobbyist. The basic facts are the same, of course, but the examples are more restricted than they need be. Still, if you want the basic facts — how the computer works, what it does, what the different, and do what systems analysis and data processing are and so on — then the book has all that, and more. He includes chapters on social aspects (unemployment, privacy etc) and what the future with computers could be like. Well illustrated, well written. Useful.

Gosling's book is good too — but it carries the wrong title. It is 90 per cent about programming in Basic with only brief (but excellent) details of other approaches (assembler, Fortran, Cobol, Pascal). Like almost all Basic programming texts it tries to be machine independent and actually is therefore most unsophisticated. In essence the Basic covered is that obtainable with terminals — nothing meaningful on graphics, Peek, Poke, etc, colour or sound. There are plenty of carefully developed programs. So unless you are a terminal user you will probably find a book specific to your machine much more helpful.

Summary

Computers is a useful general account, but biased towards business applications. *Computer programming* is good on simple Basic but would offer little to the personal micro user. KJ

Maplin ZX81 keyboard

Maplin Electronics PO Box 3 Rayleigh Essex SS6 8LR Tel 0702 552911
Price £19.95

This [illegible] adding a keyboard to a ZX81. It was designed for Maplins as a project to go into their quarterly magazine. There are 43 keys, of which six are larger than the rest. These are 0 P NEWLINE space keys and three keys which lock on a special function. The special keys are FUNCTION, SHIFT lock and GRAPHICS 2. They all require some electronics which are soldered on the right-hand side of the keyboard along with a power supply from the ZX81.

The keyboard dimensions are 13.5in × 4.5in.

The power supply connection is unique as it is a two-holed adapter to one 3.5mm plug, so that both the power supply from the Sinclair Power Pack and the keyboard can be plugged in the 3.5mm plug going into the power socket on the ZX81. This and the fact that the keyboard connections are wired which locate into the ZX81's keyboard sockets mean that no soldering is necessary on the ZX81.

The special function keys all lock into position until they are pressed again so that, say, a whole string of graphics can be written in without having to hold down the SHIFT key. The fact that the function is locked-in is indicated by two Leds (both red) and it would have been better if these had been different colours.

The keyboard is fairly easy to build for someone with a bit of kit-building behind them, but I would not recommend it for the absolute beginner. The keys need careful alignment before soldering them into position, so it would have been easier if the instructions had given details of how to put the key tops on before soldering the keys to the board. The space key arrived with not enough holes to fit the two keys. I fits over, but Maplins say that this had been corrected and that anyone with this problem will get a replacement if they contact them.

The keyboard is quite delicate and Maplins will provide a case for £4.95.

The keyboard and case is also available from Maplins in Hammersmith and Westcliffe-on-Sea. SA



Maplin's [illegible] the ZX81

Open Forum

Open Forum is for you to publish your programs and ideas. It is important that your programs are bug free before you send them in. We cannot test all of them. Contributions should be sent to Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2H 7HF.

How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs. (The usual rate is £10.)

Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented and documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper avoiding any creasing.

Please enclose a stamped self addressed envelope.

Escape

on ZX81

This is a game for the ZX81 where you have to move your man to one of the four exits and escape. Your score is given when you get out.

The doors are represented by the + signs and you are the 0 which starts in the middle of the screen. An earthquake which opens up holes at your feet hinders your escape. If you fall down a hole you will die and fail in your task.

First the doors are printed and then some holes appear on the screen. When the 0 appears you can move using the cursor keys 5, 6, 7 and 8. After moving a few squares you will be forced to stop and more holes will be formed. You will then be able to move another few squares.

You cannot move while the holes are forming. If a hole appears at the exit you are moving towards you can try and make

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Escape
by S Thickett

```
1 REM ZX81 ESCAPE
10 LET H = 0
20 LET C = 100
30 LET X = 10
40 LET Y = 15
50 PRINT AT 5,5;"+"; AT 5,25;"+
"; AT 16,5;"+", AT 16,25;"+"

60 FOR F = 1 TO 25
70 PRINT AT 5 + RND * 11,5 +
   RND * 20;"@"
80 NEXT F
90 FOR G = 1 TO 5
100 LET C = C - 1
110 PRINT AT X,Y," "
120 LET X = X + ((INKEY$ = "6") AND
   X < 16) - ((INKEY$ = "7") AND
   X > 5)
130 LET Y = Y + ((INKEY$ = "8") AND
   Y < 25) - ((INKEY$ = "5") AND
   Y > 5)
140 PRINT AT X,Y,
150 LET K = PEEK (PEEK 16398 +
   256 * PEEK 16399)
160 IF K = 8 THEN GOTO 210
170 IF K = 21 THEN GOTO 240
180 PRINT 0
190 NEXT G
200 GOTO 60
210 PRINT AT 0,0;"YOU DIE"
220 LET C = 0
230 GOTO 250
240 PRINT AT 0,0;"WELL DONE
250 PRINT SCORE=";C
260 IF C > H THEN LET H = C
270 PRINT "HIGH SCORE= ;H
280 PRINT "ANOTHER GAME?
290 INPUT A$
300 CLS
310 IF A$ = "YES" THEN GOTO 20
320 STOP
```

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your way to another icon. The symbol ♠ represents a graphics shift A character.

The following outline gives a brief explanation of the program.

Lines 1 to 58 set up the variables and doors.
Lines 60 to 98 form the maze. To make the game easier, decrease the FOR NEXT loop in line 90.
Lines 98 to 199 score you after the score and detect whether you have fallen down a hole or made it to a door.
Lines 200 to 240 print how well you have done.
Lines 300 to 320 give the score. The high score is kept if you want another game.

Nimrod

on Vic 20

Although this program is written for the unexpanded Vic-20 it uses high resolution graphics to draw the characteristic outline of the Nimrod and submarine aircraft, its bombs and the target submarine.

Compilation takes about 15 seconds at the start of the program. The Nimrod and the submarine proceed across the screen in opposite directions, the player dropping bombs from the Nimrod by pressing key B.

Unfortunately for the bomb aimer, as the aircraft remains on task it cruise-climbs to save fuel. Also the submarine cruises at greater depths to make attack more difficult.

If the Nimrod is at all successful the game speeds up. Hits are rewarded by a flashes and bangs and the player is given two cycles of 10 passes to attempt to hit as many submarines as possible.

Lines 2 to 5 form and store the high resolution graphics characters. Line 10 sets up the screen and line 15 defines the start positions for the Nimrod, submarine and bomb. Lines 20 and 25 position and colour the Nimrod and the submarine.

Line 30 controls the speed of movement of the characters; note that the timing is linked to the score Z so that as the score mounts the game becomes progressively more difficult. Line 30 here initiates the white noise representing aircraft and submarine engines.

Line 35 tests for a bomb release and line 40 tests for a bomb already in flight. The number of cycles of the program is controlled by line 55. Line 65 draws and colours the bomb and controls its trajectory.

The sea is thrown after the bomb splash by line 70. Line 75 tests for a hit and line 80 tests for a bomb on the sea bed. Lines 90 and 95 make the explosion. Reset the screen and increment the score if the bomb hits the target.

Here are the variables used:

AS Test for bomb release
BS Test for game over
S Submarine start position in location map

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Nimrod
by Mike O'Connor

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- P Submarine start position in colour map
- N Nimrod start position in location map
- D Depth of bomb below aircraft
- C Bomb position in location map
- R Constant for poking sound and video effects
- Z Score
- Y Number of program cycles

Polar Co-ordinate

on BBC Micro

This program runs on a BBC micro model A or B. When run it asks for an equation involving some angle X, eg 1+SIN X. This will plot a cardioid.

It then asks for a scale within indicated values. If the maximum value is used the plot should just fit the screen. If smaller values are used correspondingly smaller plots will result.

Some interesting functions to try are:

COS 2*X
SIN 5*X
COS X/2
5+SIN X
20 COS X

When the plot is complete it will turn from green to blue and a prompt for a further function will be displayed. The program as it stands runs in MODE 4 but could be changed to run in any available graphics mode see line 60.

Polar Co-ordinate
by J. Rowntree and Stephen Lindsay

```
10 REM POLAR CO- RDINATE PLOTTER
20 REM by J.ROWNTREE
30 REM and S.LINDSAY
40 REM
50 ON ERROR GOTO 340
60 MODE 6
70 VDU 19 1,4,0,0,0,19,0,7,0,0,0
80 PRINT PRINT:PRINT
90 PRINT" *POLAR CO-ORDINATE EQUATION PLOTTER*"
100 PRINT''" This program plots polar co-ordinate"'"
    "equations of the form:-"
110 PRINT'"   ANGLE=X  RADIUS=f(X)"
120 PRINT'"  The scale variable is A and the"'
    "  function variable (angle) is X"
130 PRINT:PRINT:PRINT
140 INPUT " ENTER FUNCTION A*"R$
150 R$="A*"+R$
160 A=100:C=0
170 FOR X=0 TO 2*PI STEP PI/18
180 B=EVAL R$:IF B>C THEN C=B
190 NEXT X
200 A=5.12E4/C
210 PRINT" ENTER SCALE BETWEEN 1 & ";INT(A-10)
220 INPUT A
230 MODE 4
240 VDU 19,1,2,0,0,0,19,0,7,0,0,0
250 X=0:R=EVAL R$:MOVE R*COS(X)+640,R*SIN(X)+512
260 FOR X=0 TO 2*PI STEP PI/150
270 R=EVAL R$
280 DRAW R*COS(X)+640,R*SIN(X)+512
290 NEXT X
300 VDU 19,1 4 0,0,0
310 PRINT TAB(5,2),"R=";R$;"  A=" A
320 PRINT TAB(1,130);
330 GOTO 140
340 CLS
```

Brickout

on Vic 20

This version of Breakout will work on any Vic and includes a high score feature and four levels of play. Maximum points possible are — Level 1 300 points Level 2 600 points Level 3 900 points Level 4 1200 points. The number of balls left is printed each time a ball is missed.

Program notes

40-50	Checks where Basic Program starts. Peek (44)=18 if at least 8K memory expansion is present. F=starting position of screen character memory. F1=value to be added to F to obtain screen colour location
90-100	Draw wall and surround.
190	Draw bat.
200	Position ball in random spot to left of wall
210	Rub out ball
250	Compute new position of ball.
290	Checks for obstacle in path of ball
300	Prints ball in new position
310	Branches to ball moving subroutine for number of times dependent on skill level
400	Checks which obstacle ball has met.
410	Ball hits side surround
[illegible]	Ball hits bat. Ball rebounds according to which part of bat is hit.
[illegible]	Ball hits wall
470-470	Ball hits [illegible] surround.
480-510	Ball missed by bat.

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520-590	End of game
600-640	Subroutine to reposition bat.
900	Subroutine to randomise deflection of ball from wall.
1000-1050	Subroutine to increase score when brick hit. Line 1005 shows colour of brick hit, and 1010 multiplies score accordingly
1200	Sound subroutine.

```
350 IF E*R=17 THEN M D[illegible]
360 PRINT PRINT  BINT"   sorry [illegible] Try again "
370 X=INKEY(5*1)
380 RUN
```

Brickout

by John Ireland

PROGRAM OF THE WEEK

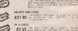
```
1 REM********BRICKOUT****
2 REM*BY JOHN IRELAND*
3 REM*********************
5 PRINT "J" POKE36879 93 GOTO1900
10 PRINT "J" POKE 36879 1" N=26876 POKE36879 42
30 PRINT "██████*********" PRINT "████ BRICKOUT *" PRINT "█████**********"
40 IFPEEK(44)=19THENF=4096 F1=33792 GOTO70
50 F=7680 F1=38720
70 PRINT "████████████████SKILL LEVEL████████████1 TO 4?" GETP$ SL=VAL(P$)
72 IFP$="THEN70
74 IFSL<1ORSL>4THEN70
76 PRINT "J" SK=5-SL
80 POKE36879 93 TL=5
90 A=F+36 B=F+454 C=0 V=22
100 FORI=ATOBSTEPV POKEI 160 POKEI+F1 0 NEXT
110 A=A+1 B=B+1 C=C+1
120 IFC=5THEN140
130 GOTO100
140 FORI=FTOF+21 POKEI 111 POKEI+462 119 POKEI+F1 7 POKEI+462+F1 7 NEXT
150 FORI=F+22TOF+440STEP22 POKEI 96 POKEI+21 107 POKEI+F1 7 POKEI+F1+21 7 NEXT
160 Z=F+243 POKEZ 106 POKEZ-22,106 POKEZ+22 106
200 L=INT(RND(1)*20)*22+F-35 POKEL 81 L1=L
210 A=-1 C=22
220 B=INT(RND(1)*3)-1 IFB=0THEN220
250 POKEL1 32
260 L1=L+C*B+A
290 IFPEEK(L1)<>32THEN400
300 POKEL1 81 L=L1
310 FORI=1TOSK S=PEEK(203) GOSUB600 NEXTI
390 GOTO250
400 P=PEEK(L1)
410 IFP=111ORP=119THENB=-B T=220 GOSUB1200 GOTO260
420 IFP<>106THEN460
430 T=250 GOSUB1200 IFZ=L-1THENA=-A B=0 GOTO260
440 IFZ>L-1THENA=-A C=-22 B=1 GOTO260
450 A=-A C=22 B=1 GOTO260
460 IFP=160THENGOSUB1000 POKEL1 32 POKEL1+F1 1 A=-A L=L1 GOTO260
470 IFP=107THENT=200 GOSUB1200 A=-A
475 IFP=107ANDB=0THENGOSUB900 IFB=0THEN475
476 IFP=107THEN260
480 TU=TU-1
490 IFTU=0THENFORI=1TO5 FORT=130+1TO250+1STEP10 GOSUB1200 NEXT NEXT GOTO520
495 POKEZ 106 POKEZ+22,106 POKEZ-22,106
500 FORI1=1TO5 T=225 GOSUB1200 T=235 GOSUB1200 NEXT
505 PRINT "████████████████████" TU"LEFT", FORI=1TO1000 NEXT
506 PRINT "███████"
510 FORI=1TO1000 NEXT GOTO200
```

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```
[illegible] RINT "[illegible]YOU SCORED SC
[illegible] THEN HS=SC
[illegible] NT [illegible] HIGH SCORE = HS
[illegible] PRINT [illegible]WANT ANOTHER GAME?
[illegible] IF P$="Y" THEN SC=0 GOTO10
[illegible] PR$="N" THEN END
530 GOTO570
600 Z1=Z
605 IF P=27THENZ1=Z+22
610 IFP=29THENZ1=Z+22
620 IFZ1<F+45OR21>F+41THENRETURN
625 IFZ1>ZTHENPOKEZ1+22 180 POKEZ 22 32 Z=Z1 RETURN
630 IFZ1<ZTHENPOKEZ1-22 185 POKEZ+22 32 Z=Z1 RETURN
640 RETURN
900 B=INT(RND(1)*3)-1 RETURN
1000 T=24 [illegible] 1200
1005 PL=(PEEK(L1+F1)AND15)
1010 SC=SC+ PL [illegible]
1015 PRINT "[illegible]SCORE"SC
1020 IF [illegible] THEN [illegible] RETURN
1030 [illegible]
1050 RETURN
1200 POKE [illegible] FOR [illegible] NEXT POKE [illegible] RETURN
1500 PRINT [illegible]
[illegible] PRINT [illegible] BREAKOUT [illegible]
[illegible] PRINT [illegible]
2000 PRINT "[illegible] THE > KEY TO MOVE THE BAT [illegible] MORE [illegible] POINTS ARE SCORED
2010 PRINT "FOR EVERY BRICK HIT [illegible] AND INCREASE WITH EACH COLUMN "
2020 PRINT "POINTS [illegible] INCREASE ACCORDING TO THE SKILL LEVEL
20[illegible] PRINT "PRESS ANY KEY TO START"
2040 GETA$ IFA$="" THEN2040
2050 [illegible]
```







World Cup

on ZX81

World Cup was written for the World Cup in June. The object of the game is to stop as many of the balls as possible from entering your goal. You have to try and stop 10 balls and your score will be displayed after each ball.

You can change the number of balls by changing the IF statement in line 230. To make the game even harder you could renumber line 80 to line 145.

The variables used in the game are:

T — To give you the score of how many goals have been saved
X — Gives you the row in which the goalkeeper is
Y — The column in which the goalkeeper is
C — The number of balls used so far
P — The column in which the ball will arrive to go into the goal
A — The column where the ball will start before entering column P
B — The row in which the ball is

Dice Thrower

on ZX81

This automatic dice thrower program for the unexpanded ZX81 generates two random dice scores. This program can either be incorporated into larger programs as a sub-routine, or used on its own for dice and card games.

The dots on the dice are printed together with their combined scores. To throw the dice again simply press Newline.

World Cup
by Graham Reed

Dice Thrower
by Kenneth Hart

Programming

Matching the psychology of a computer

Boris Allan presents a games program for the ZX81 that learns as it plays.

Stone blunts scissors, but paper wraps stone and scissors cut paper. Stone ends scissors ends paper beats stone beats scissors.

This is a very old game where the stone is a fist, paper is a flat hand and scissors are two open fingers. Basically it is a game of psychology. In theory there is no way of predicting what your opponent will do next, but quite often you can make a good guess. The psychology comes in hiding your own pattern of behaviour while trying to break down your opponent's pattern.

This version of the game is called rock, scissors, tissue because the initials r,s,t are in consecutive order in the alphabet. The program just fits in a 1K ZX81.

This program is a learning program. It enables the computer to remember how many times its opponent has played a certain move. The computer takes the player's last move, isolates his next most likely move and works out the correct response.

Information about the moves is stored in a 3 by 3 matrix A. The cell A(L,Y) contains the number of times when the last move L was followed by move Y.

In this matrix 1 corresponds to rock, 2 corresponds to scissors and 3 corresponds to tissue. Thus A(2,3) is the cell for last move scissors and next move tissue.

On the ZX81 code R is 55, code S is 56 and code T is 57. If 54 is subtracted from the code value for the initial letter, then R, S and T become 1, 2 and 3.

As rock (1) beats scissors (2), scissors (2) beats tissue (3) and tissue (3) beats rock (1) we can see a pattern emerging. If the value of the computer's move is one greater than the value of the player's move, then the computer loses (assuming that 3+1 is regarded as equal to 1). Therefore if the computer predicts that the player is most likely to make a certain move it adds 2 on to the value of that move to get the winning response.

The program starts by setting I=1, J=2, and K=3. Lines 130 to 190 then make initial assignments to the variables after setting a non-repeating random start by RAND.

The variable L is used to record the player's last move. Line 140 gives it an initial random value from 1 to 3. Variable Y, the player's present move, is given a random starting value by line 150. These random values are then used to enter random 1s in the move matrix, giving the program an in-built but unknown bias. Line 990 clears the screen and starts the move routine.

Lines 1000 and 1010 search through the three elements on row Y of the move matrix to find the largest number. This shows the most popular combination used so far by the player, ie after move Y he is most likely to make move N. Given the player's most likely move, line 1030 calculates the computer's response.

Line 3000 determines who has won. If W=1 then the computer wins, but if W=2 then the player wins.

LISTING 1

```
  10 REM    ROCK,SCISSORS,TISSUE
  20 REM    (C)  G J B ALLAN,1982
  60 LET I=SGN PI
  70 LET J=I+I
  80 LET K=INT PI
  90 DIM T(J)
 100 DIM R(K,K)
 110 DIM P$(J,J)
 130 RAND
 140 LET L=INT (RND*K+I)
 150 LET Y=INT (RND*K+I)
 160 LET A(L,Y)=I
 170 LET A([illegible],L)=I
 180 LET P$(I)="ME"
 190 LET P$(J)="YE"
 990 CLS
1000 LET N=I+(A(Y,I)<=A(Y,J))
1010 LET N=N+(A(Y,N)<=A(Y,K))*(K
-N)
1020 LET L=Y
1030 LET N=N-I+K*(I=N)
2000 PRINT P$(J),"  ",
2010 INPUT Y$
2015 IF Y$="[illegible]" THEN GOTO 2010
2020 PRINT Y$
2030 LET Y=CODE Y$-CODE "Q"
2040 PRINT P$(I),"  ",CHR$ (N+CODE "Q")
2050 LET A(L,Y)=A(L,Y)+I
2060 INPUT Y$
2070 IF Y=N THEN GOTO 990
3000 LET W=Y-N+K*(N>Y)
3010 LET T(W)=T(W)+I
3020 PRINT P$(W)," WINS",,P$(I),
" ",T(I),P$(J)," ",T(J)
3030 INPUT Y$
3040 GOTO 990
```

Spectrum

In this new and various contributors explore different aspects of the ZX Spectrum

From fans to the third dimension . . .

Nick Hampshire continues his series on graphics with some standard 3D programs

Last week I presented two relatively simple programs for rotating a graphic image on the Spectrum. The first simply moved a single point around the screen in a circle. This was a development of our attempt to by-pass the Spectrum's circle command which as we have discovered has a number of disadvantages.

The second program was simply a variation of the first program. It rotates a line stretching out from the centre of the screen around that point.

The first program this week, Figure 1, takes the program a stage further in trying to create the impression of a rotating fan. I have added the colour just for effect — it has no material place in the program. You may however like to try changing the colours yourself to make the image more pleasing.

Figures 2 and 3 are simply a couple of fairly standard 3D graphics routines which I have tried on the Spectrum. As you can see the functions are contained in line 60 in both programs. It is interesting to try these programs on the Spectrum simply to give yourself an idea of how fast, or from some points of view how real, the Spectrum is.

As you can see from the two programs it is quite straightforward to change the functions in line 60 to create different images.

Just for fun I have thrown in Figure 4 which creates random blocks of colour on the screen.

As you will have seen on the news pages the Spectrums now going out are being modified to overcome the clash on the data bus between the ULA and the Z80A CPU which we reported three weeks ago. We now have one of the first production batch which has the new modification hand soldered in. By now the modification should be built into the production run.

The modification gives priority to the Z80A over the ULA when both are trying to use the same data. In all other respects the production version of the Spectrum appears to be the same as the pre-production models which we have to date been using for this page.

The only difference which we have noted is that Sinclair, in response to the criticism in the *Popular Computing Weekly* review of the machine in Vol 1 No 3, has increased the size of the characters on the keys. The red legends are still difficult to read in bad lighting but the change is an improvement.



Fig. 3

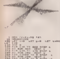
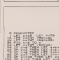


Fig. 1



Fig. 2



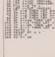


Fig. 4



In tune with the season?

This program, written on a BBC Micro Model A with 32K, uses the sound function available on the BBC Micro to play the tune "The Green Leaves of Summer".

It uses two lists — the first is a list of notes from A sharp and B in octave 1 (lowest notes) through 5 full octaves (2 to 6) to C, C sharp and D in octave 7 (highest notes). The format for this list is

Code $ (1) A # 1
Code $ (2) B1
Code $ (3) C2
Code $ (4) C # 2
to
Code $ (65) D7

The last figure denotes the octave number; in the end an octave goes from C, C # etc to B. Flat notes are denoted as the sharp of the note below it, ie to get B flat use A sharp.

The frequency table set up at line 80 defines frequencies for Sound commands corresponding to notes. Start the data table by assigning the octave in which the following notes are to be played: (ie 03 assigns the following notes to octave 3). The format of the music data table is the octave (ie 03), then the note and time duration. D2 is note D lasting 2 time units. G8 is note G lasting 8 time units. MAX 8 time units.

It is very important not to include spaces in or at the end of the data table as the program will not recognise it. Instead it will print "No-match! Note = " This is useful as it tells you immediately which note has been rejected.

In the Sound command in line 310 the 1, −15, freq (N), T × 5 is explained by: 1 which I think is always 1, −15 is the volume, freq (N) determines the tone, and T × 5 is the time duration in time units.

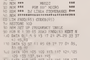
To change the speed of the music, change the value T in line 310. At the moment it is "T × 5". Changing it to "T × 4" would speed it up and "T × 6" would slow it down.

To change the volume, change the −15 in line 310. The volume ranges from −0 to −15, −15 being the loudest.

If you want to alter the actual tune played by the computer, change the values in the data table which begins at line 330. To help you find the notes use the following table.

F
E
D
C
B
A
G
F
E
D
Middle C
B
A
G
F
E
D
C
B
A
Lowest note G
octave 4
octave 3
octave 2
octave 1

Although the program was written on a 32K machine it will Run on a 16K machine. Also at the moment the program restores and plays again. To stop this type "end" instead of "70" in line 270.



```
10 REM ********************************
20 REM ***          MUSIC           ***
30 REM ***      FOR BBC MICRO       ***
40 REM ***   BY LINDA STONEBANKS    ***
50 REM ********************************
60 DIM FREQ(65) CODES$(65)
70 RESTORE 100
80 REM SET UP FREQUENCY TABLE
90 FOR N 1 TO 65 READ FREQ(N) NEXT N
100 DATA 0 1 5 9 13 17 21 25 29 33 37
    41 45,49
110 DATA 53 57 61 65 69 73 77 81 85,
    89 93 97
120 DATA 101 105 109 113 117 121,125
    129 133 137,141 145
130 DATA 149 153 157 161 165 169 173
    177 181 185 189 193
140 DATA 197 201 205 209 213 217 221
    225 229 233 237 241
    DATA 245 249 253
160 REM SET UP CODE TABLE
170 CODE$(1) A£1 CODE$(2) A1
180 CODE$(63) C7 CODE$(64) 'C£7
    CODE$(65 'D7
190 FOR OCTAVE 0 TO 4
200 RESTORE 240
210 FOR NOTE 1 TO 12
220 READ CODE$ OCTAVE*12+NOTE+2
    CODE$ OCTAVE*12+NOTE+2)=CODE$
    (OCTAVE*12+NOTE+2)+STR$(OCTAVE+2)
230 NEXT NEXT
240 DATA C,C£ D D£ E,F F£ G G£ A A£ B
250 REM BEGINS TO READ MUSIC CODES
260 RESTORE 330
270 READ NOTE$ N=1 IF NOTE$ "END"
    THEN 70
280 IF LEFT$(NOTE$ 1) "O" THEN OCTAVE
    =VAL(RIGHT$(NOTE$ 1)) GOTO 270
290 T=VAL(RIGHT$(NOTE$ 1)) NOTE$=LEFT
    $(NOTE$,LEN(NOTE$) 1)
300 NOTE$=NOTE$+STR$(OCTAVE)
310 IF NOTE$=CODE$(N)THEN SOUND 1,-15
    FREQ(N) T*5 GOTO 270 ELSE N=N+1 IF
    N>65 PRINT"NO-MATCH! NOTE  " NOTE$
320 GOTO 310
330 DATA O3 D2 G6 A1,C1 F£2,D4 D2 D6,
    A1 A£1 A2 F4,F2 A£6,A1 A£1 C4 C2,
    O3 G4 O4,C2 C£6 O3 A1 O4 C£1 D6
    D1 D£1
340 DATA F6 D£1 D1 C2 O3 G4 O4,C1 D1,
    D£6 D1 C1 O3 A£2 F4 A£1 O4,C1 D6,
    C1 O3,A£1,A2 O4 C4 O3 A2 G4 A£2,
    G2,A6 G2
350 DATA G6 A1 C1 F£2,D4 D2 O6 A1,A£1
    A2 F4 F2 A£6 A1 A£1 O4 C2 O3 G4
    O4,C2 C£6 O3 A1 O4 C£1 D6,D1 D£1
360 DATA F6 D£1 D1 C2 O3 G4 O4 C1 D1
    D£6 D1 C1 O3 A£6 A£1 O4 C2 D6 C1
    O3 A£1 A2 O4 C4,O3 A2 G6,A1 F£1 G8
370 DATA END
```

Peek & poke

Peek your problems to our address. Ian Beardsmore will poke back an answer

NOW I'VE GOT ONE, WHAT DO I DO?

S. [illegible] of [illegible] Bridge Road, [illegible], writes

Q I own a BBC microcomputer and would like to know how to use the teletext graphics. The user guide does not even mention the subject.

Secondly, could you please tell me how to turn off the BBC machine's cursor. I have tried [illegible] but it showed no sign of working.

A To use the teletext graphics you have to be in mode 7. To change into the teletext colours enter PRINT CHR$ 129; this will change that line of text to red. You will have to enter this at the start of each line you want to use the colour on.

If you want to use the actual graphics, then add 16 to the number that will change the text colour. Thus PRINT CHR$ 145 will mean that all characters after this statement on the line will be in red. Again this statement will have to be entered on every line where you want to use the teletext graphics. The complete list of codes is:

CODE	COLOUR	GRAPHIC CODE
129	RED	145
130	GREEN	146
131	YELLOW	147
132	BLUE	148
133	MAGENTA	149
134	CYAN	150
135	WHITE	151

The form you quote for turning the cursor off is based on the form used on the Acorn Atom. The BBC machine is quite different. Use the following:

VDU 23 [illegible]

SEEING THINGS IN BLACK AND WHITE

Ian Jones of Woodside Road, Bristol, writes

Q Not long ago I read in a magazine that there are certain PCB changes suggested by Sinclair which can be made to the ZX81 to change the screen output from black characters on a white background to white characters on a black background. This reduces the eye strain considerably. Have you any idea what these changes are?

A The short answer is no. The black on white screen format of the ZX81 is stored on the chip itself and so is effectively impossible to change. Are you sure that you have not got it muddled up with the ZX80 which could be changed by altering the PCB?

IT'S BASIC BUT IT'S NOT BASIC ENOUGH

M. F. Gregg of Chase [illegible] Street, Sutton in Ashfield, writes

Q I have recently purchased a ZX81. Unfortunately I am having difficulty in understanding the users handbook. Could you tell me if there is a publication that would simplify the Sinclair Basic?

Also, is it possible to use the ZX81 to store a collection of 4,000 records?

A With 30 or 40 books on the market all trying to simplify the handbook it is not easy to choose a particular book. Some would only make things worse while others need a certain amount of knowledge before they become of any use.

The two books which I feel would be of most use to you are *Getting Acquainted With Your ZX81* by Tim Hartnell and *Byteing Deeper Into Your ZX81* by Mark Harrison. Tim's book is a simple games orientated primer that will teach you quite a few of the ground rules almost without you realising it. Mark Harrison's book is more of a teach yourself book. It has fewer programs than *Getting Acquainted With Your ZX81* but it deals systematically with all aspects of the ZX81 from switching on to machine code.

Between them these two books should teach you all the manual tries to and some more besides. *Getting Acquainted With Your ZX81* can be obtained from Interface, 44-46 Earls Court Road, London W8 6EJ. *Byteing Deeper Into Your ZX81* published by Sigma Technical Press is available from Dillons University Bookshop, Malet Street, London WC1.

If your ZX81 is unexpanded it would take such a vast number of cassette tapes to store the information that the system would become untenable. Even with a 16K RAM pack it would still need a large amount of work and many tapes.

To make such a large amount of storage really viable you would need one of the large add-on RAM packs such as the Memotech 48K or the 64K from Audio Computers. Even better would be the Microfile disc drive but this costs far more than the ZX81 itself.

It might be better to wait until the ZX Microdrive comes out because it will almost certainly be possible to interface the microdrive with the ZX81. This will probably take until Christmas, but by then you should have a lot more knowledge about computers.

PLAYING DIRTY IN THE RIGHT SPIRIT

T. V. Chandra of High Street, Walthamstow, London, writes

Q I have recently purchased a ZX81 with RAM pack. However I have noticed that the expansion port at the back of the ZX81 has become dirty owing to constant use.

I have consulted various books on the matter and one says that when the copper fingers covered in shiny solder become dirty the only way to clean them is with methylated spirits. However the book says that you should use industrial methylated spirits and I can only find the mineralised type which has a purple dye. I looked up both types and found that the clear industrial type does not have 0.5 per cent pyridine or the purple dye.

I am worried that if I use the methylated spirits with the dye it might contaminate the connections making the ZX81 useless with the 16K RAM. Can you please advise whether I can use this sort of methylated spirits and if not where can I get the industrial type?

A You need not worry about using methylated spirits mineralised or industrial. The violet dye is inert and pyridine is no cause for concern either. It is slightly alkaline and soluble in water, alcohol and fatty acids and is considered safe enough to be used as a solvent. The only reason that it is not used in some industrial forms of methylated spirits is that a pure alcohol is needed.

GETTING HUNG-UP ON THE SCORE DRAWS

J. Ashburne of Church [illegible], [illegible] Wales, writes

Q I have a ZX81 fitted with 32K memory. Together with a colleague I have written a program which we intend to use for the football pools.

The program consists of an array A$ of 7187 lines of 8 numbers and an array B$ of 55 lines of 8 numbers. Two loops delete all the lines of A$ that do not agree with each line of B$ in any of the eight positions. The remaining A$ lines are left as printed.

The lines of the arrays only consist of numbers between one and three, but it takes so long to process the 55 lines of the B$ array that the program as it stands is useless. We have to repeat it about seven times to complete the operation. What we have in mind is loading the program from tape each time, as the array B$ is always different. If we then typed in GOTO 60 followed by the new batch of 55 lines will this overwrite the old array?

A What you say is correct. You will have to use GOTO because RUN will delete the variable A$ which you want to keep.

As a further safeguard you might find it useful to edit out the initialisation part of the program that actually inputs the value of A$. This is covered on page 146 of the manual.

Competitions

Puzzle No 12

There was a [illegible] recently at Greyfriars School when it was discovered that there had been a [illegible] in the tuck shop and a large [illegible] of fudge had been taken.

No amount of threats could reveal the culprit but certain boys, namely Beetle, DeVere, Ferrer, Hickey, Lowell, Nanson, O'Toole and Struth, were unable to account for their whereabouts at the relevant time.

An anonymous note was later found and in heavily disguised writing it read:

The other night when all were fast asleep
Across the moonlit lawn I saw a figure creep.
To tell on fellow pupil is not my game,
But if you take the letters of his name
And with numbers substitute for letters there
He is the one that gives the largest square.
Who dunnit?

Solution to Puzzle No 8

11	12	13	14	15	16	17	18
21	[illegible]	[illegible]	24	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
41	42	43	44	45	46	47	48
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	67	[illegible]
[illegible]	72	73	74	75	76	77	78
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Although parts (a) and (b) can be solved in one [illegible] program which lists each of the 36 possible throws [illegible] with two dice, together with the scores, to find the answer to (c) it is necessary to play the game. A program has to be written to draw the board and play the game by placing and removing counters.

In the diagram above each square on the board is defined by [illegible] number which is [illegible] PRINT AT location. The sequence [illegible] are traversed can be [illegible] string A$. Thus [illegible] cumulative dice score [illegible] location that we [illegible]

LET L = VAL A$(..T
LET C = VAL A$(?

Thus PRINT AT L [illegible] corner of the location.

A DIM statement can be used [illegible] on the squares visited (by [illegible] here) so that they can be checked [illegible] second stage of the game [illegible] whether to place a counter or to remove [illegible] already on that square.

The answers are as follows:

a) Lowest score — a throw of 2 and 4 gives [illegible] 6
b) Highest score — a throw of 2 and 3 gives [illegible] 37
c) Throws of 1 and 3, and 3 and [illegible] enlarged chessboard pattern. Other [illegible] ing patterns are generated with throws of [illegible] and [illegible] 2 and 5, and double 4.

Winner of Puzzle No. 8

The winner is R J Viney, Station Road, Oakham, Rutland, who receives £10.

Solution to Crossword No. 8

Across 4 Acorn, 7 Package, 8 Attack, 10 Agape, 12 Sump, 13 Even out, 14 Bind, 15 Hinds, 16 Levers, 20 Fingers, 21 Scope

Down 1 Tangerine, 2 Sh ipped, 3 Ego, 5 Cut, 6 Rio, 8 Arlen, 9 Commodore, 11 Texas, 12 Strings, 17 Vic, 18 Rip, 19 Den

Winner of Crossword No. 8

There was no correct entry to Crossword No. 8.

Crossword No 12

[illegible]

Down

[illegible]

CITIZEN PAIN

BY DAVID IRELAND and JAMES MACDONALD


commodore
COMPUTING